COMPARATIVE STATEMENT RELATIVE TO THE CONSUMPTION OF WATER IN THE SEVERAL CITIES AS FOLLOWS:

YEAR 1881.	New York.	Brooklyn.	Boston.	Newark.	Providence.	Pawtucket.	Fall River.
Number of meters in use	6,500	1,208	1,385	186	5,129	1,500	1,000
Annual cost of repairs	Owner repairs meter.	$3,400	No figures.	No figures.	No figures.	20c. each.	Owner repairs meter.
Annual revenue	$1,600,000	924,316	$1,323,171	$307,530	$260,530	$55,000	$114,000
Population	1,300,000	500,000	415,000	138,000	104,850	40,000	50,000
Daily consumption in gallons	100,000,000	32,731,500	38,214,030	9,888,583	3,716,937	2,000,000	2,000,000
Daily average consumption through meter	15,000,000	3,550,500	4,512,750	No figures.	No figures.	No figures.	No figures.
Number of taps in use	85,000	62,000	60,000	11,902	10,745	2,629	3,050
Percentage of taps metered	7.65 per cent.	1.05 per cent.	2.30 per cent.	1.57 per cent.	47.74 per cent.	57.05 per cent.	62.29 per cent.
Percentage of daily consumption in gallons registered by meter	15 "	10.28 "	11.81 "				
Daily consumption in gallons per capita	76.92 "	58.44 "	92.08 "	71.62 per cent.	34.50 per cent.	50 per cent.	50 per cent.
Meter considered the best	Crown and Worthington.	Crown.	Crown and Worthington.	Worthington.	Crown.	Crown.	Crown.
Meter furnished by	Consumer.	Consumer.	City.	City.	Consumer.	Consumer.	Consumer.

NOV. 2, 1882. Compliments PETER MILNE, JR., Water Purveyor, Brooklyn, N. Y.

CONSUMPTION OF WATER.

The above interesting table of water statistics has been carefully compiled from the very latest information, by the well known and capable Water Purveyor of Brooklyn, Mr. P. Milne, Jr., through whose courtesy we are enabled to present the same to our readers.

The wilful waste of water in affecting the taxpayers is now a matter of great and growing interest in every community. It is universally conceded that in the meter system lies the only remedy for this growing evil. The above table strikingly illustrates the advantages of meters in regard to revenue and consumption of water. The figures furnished by the Water Department of Providence are worthy of more than passing notice when compared in some of their features with the results obtained in other cities.

As a very strong evidence of the utility of the meter system, a comparison of the daily consumption of water and the revenue derived from it in Providence, where nearly 48 per cent. of the taps are metered, presents some interesting figures alongside of those shown from New York, Brooklyn and Boston.

Providence has a daily consumption of 3,716,937 gallons, from which it derives an annual revenue of $260,530. New York has a daily consumption of 100,000,000 gallons, from which it derives an annual revenue of $1,600,000, with not quite 8 per cent. of the taps metered. Brooklyn has a daily consumption of 32,731,500 gallons, with an annual revenue of $924,316, with a little over 1 per cent. of the taps metered. Boston has a daily consumption of 38,214,000 gallons, and an annual revenue of $1,323,171, with a little over 2 per cent. of the taps metered.

The point we desire to make is, that for the daily consumption of water in proportion to the number of inhabitants and the amount of revenue derived the city of Providence exemplifies in a marked degree the benefits of the meter system, and presents arguments in its favor in this respect that are seemingly unanswerable.

CONTRACTING IN BRAZIL.

From the Rio News, Oct. 5.

The last specified period of the contract for the construction of the Rio do Ouro water-works of this city, that of the contractor's guarantee, expired on the 27th ult. According to the terms of the contract and to all the ordinary laws of business, the accounts should have all been settled and paid on that date, and the contractor discharged from all further liability. It is worthy of note, however, that nothing of this kind has been done. The cash sureties deposited by the contractor, are still retained by the government, no inventories have been taken, the final measurements have not been made, and not one single account has been liquidated. The claims against the government under this contract amount to about 1,500,000$ the greater part of which promises to be lost. Even payments on undisputed accounts are wilfully delayed. The contractor has been subjected to needless delays in the execution of his work, to the petty whims of government engineers, to extra expenses for which no allowances have been made, to extraordinary requirements for which payment is refused, to losses on materials required by the government which now declines to accept them except at a ruinous reduction, to fines, delays and annoyances of every kind and description. The Rio do Ouro tramway alone, which the contractor was compelled to keep up eighteen months over the time specified, has occasioned a loss of fully 400,000$, which the government engineers now decline to recognize. Even the small amount of 8,000$ expended in repairing damages after the rains of February and March last, at a time when the line was kept open simply for the convenience of the government, remains unpaid. The Pedregulho inclined plane, which was twice moved to suit the whims of the government engineers, leaves a loss of not less than 25,000$. Several branches of the work, notably that of the reservoirs, were carried out according to the plans and specifications of the government engineers, under their supervision, and then the contractor has been fined because of defective work. The contract guaranteed a premium to the contractor in case the introduction of water into the city was made before certain specified dates, and although the government engineers were decorated for this achievement, the contractor has been refused the premium. The personal prejudices of all the parties concerned, from the late Minister Buarque de Macedo down to the lowest subordinate, have been allowed to influence the execution of the contract and its liquidation. The only logical conclusion to be drawn from the matter is that the government has fully resolved to delay and refuse payment in every possible case. Men who are openly hostile to the contractor, through personal difficulties, are placed in official positions where all the expert reports and decisions must pass through their hands. Under such circumstances it is highly improbable that justice will be accorded in the settlement of these claims; it is even improbable that justice is intended. In this connection it is reported that the contractor, Mr. Antonio Gabreilli, has recently transferred all his claims to his bankers, who will hereafter press matters on the very substantial ground of cash advanced. It is to be sincerely regretted that this great enterprise has turned out in this way—either in a loss of credit to the government or a pecuniary loss to the contractor. However it may be settled, this one contract will hereafter be a stumbling block in the way of the government. No other contractor will knowingly place himself in a position similar to that just occupied by Mr. Gabreilli.

ENGINEERS' CLUB OF PHILADELPHIA.

ROOMS, No. 1523 CHESTNUT STREET, PHILADELPHIA, PA.

OCTOBER 21., 1882.—Mr. Washington Jones was called to the chair. Fifteen members and two visitors present. Col. Livingstone, of Philadelphia, described the system of driven wells, giving various data and statistics with regard to results obtained in this and other localities.

Dr. H. M, Chance described several horse-shoe or ox-bow bends occurring in the streams of Western Pennsylvania, attributing the origin of each and every similar loop to synclinal axes.

Loops on the Allegheny River at Brady's Bend and at Scrubgrass (also an old abandoned loop at Parker, 200 ft above the present channel); on the Red Bank Bank Creek near Bethlehem; on Kettle Creek in Clinton County, and old abandoned bends at Callonsburg on the Clanin River, and near Westport in Clinton County, were described, the inevitable synclinal axis present at all of them, affording the only explanation of their origin.

HOWARD MURPHY, Secretary and Treasurer.

BIDS FOR DOCK DEPARTMENT WORK.—The Dock Commissioners on the 3d inst. opened bids for department work. The Union Dredging Company was the only bidder for dredging at the foot of East Twenty-fourth street, and at the dumping boards on Pier No. 61 East River, at the foot of East Seventeenth street, East Twenty second street, and West Forty-seventh street. The estimate was 27 cents per cubic yard at the foot of East Twenty-fourth street and 30 cents per cubic yard for the remainder of the work. John Gillies' bid of $14,706 was the lowest for repairing the pier at the foot of East Fifth street, and Moses Engle's bid of $5,975, the lowest for repairing the bulkhead at the foot of East Seventeenth street. Through a clerical error, James D. Leary bid $5,990 for the larger job and $15,990 for the smaller. The Commissioners, however, were compelled to accept the former bid, and he was given notice to that effect.

IMPROVEMENT OF THE UPPER MISSISSIPPI.

The following are abstracts of proposals received and opened by Major A. Mackenzie, Corps of Engineers, U. S. A., Rock Island, Ill., at 2 p. m. Sept. 23, 1882:

Abstract of Proposals for dredging at Dubuque, Iowa.

Names of Bidders.	Residence.	Price per cu. yd. for Dredging.
		Depositing at a distance not exceeding one mile.
H. S. Brown	Quincy, Ill.	23
H. Fox & Co.	Chicago, Ill.	24
B. E. Linehan	Dubuque, Ia.	19¾
A. J. Whitney	Keokuk, Ia.	22

Abstract of Proposals for dredging in Quincy Bay, Ill.

Names of Bidders.	Residence.	Price per cu. yd. for Dredging.	
		Depositing at a distance not exceeding one mile.	Depositing at a distance not exceeding two miles.
H. Fox & Co.	Chicago, Ill.	21	23
H. S. Brown	Quincy, Ill.	20	22
A. J. Whitney	Keokuk, Ia.	21¼	23½
B. E. Linehan	Dubuque, Ia.	21¾	23

Abstract of Proposals for constructing dams and shore protections of brush and stone between Mt. Vernon, Minn., and Fountain City, Wis.

Names of Bidders.	Residence.	Brush.	Stone.
		Per cu. yd.	Per cu. yd.
J. Richtmay	Ft. City, Wis.	95	1.45
S. J. & A. H. Truax	Hastings, Minn.	1.10	1.75

The above prices include all cost of furnishing and putting in the dams, etc., brush and stone.

Abstract of Proposals for constructing dams and shore protection of brush and stone between Homer, Minn., and Queen's Bluff, Minn.

Names of Bidders.	Residence.	Brush.	Stone.
		Per cu. yd.	Per cu. yd.
S. J. & A. H. Truax	Hastings, Minn.	98	1.46
S. D. Van Gorder	Winona, Minn.	1.40	1.85
P. S. Davidson	La Crosse, Wis.	95	1.35

The above prices include all cost of furnishing and putting in the dams etc., brush and stone.

Abstract of Proposals for completing dams and shore protections of brush and stone between La Crosse Bridge, Wis., and Brownsville, Minn.

Names of Bidders.	Residence.	Brush.	Stone.
		Per cu. yd.	Per cu. yd.
P. S. Davidson	La Crosse, Wis.	85	1.25
S. J. & A. H. Truax	Hastings, Minn.	1.10	1.75
D. A. McDonald	La Crosse, Wis.	92	1.53

The above prices include all cost of furnishing and putting in the dams, etc., brush and stone.

THE hydraulic pumps at the Combination Shaft on the Comstock lode are now raising 2,000,000 gallons of water daily, which is discharged through the Sutro Tunnel. This amount of water weighs 8,333 tons. The pumps raise the water 800 ft. at one lift. To operate the pumps requires 1,000,000 gallons of water per day, having a head of 2,830 ft. perpendicular, conducted from the Virginia & Gold Hill Water Company's reservoir through an 8-inch pipe to the 2,400-foot level of the mine, where the pumps are situated.

IMPROVEMENT OF THE POTOMAC FLATS.

Bids were opened last Monday by Colonel Peter C. Hains, U. S. A., engineer officer in charge of the improvement of the Potomac Flats, Washington, D. C., to dredge out and deposit upon the flats 1,700,000 cubic yards of material. These bids were advertised for throughout the country, and at the appointed hour eight bids, from as many bidders, had been presented as required. Representatives of all the bidders were present, including Lieutenant Commander Henry H. Gorringe, U. S. N., (who removed the celebrated Egyptian obelisk from Alexandria to the Central Park in New York), who represented the American Contracting and Dredging Company, of New York city. All the bids were accompanied by securities to enter into bonds to perform the work if the contract was awarded to the bidder, and each one proposed to complete the number of yards mentioned in the advertisement by August 31, 1883. The bids were as follows: William H. Adams & Co., of Washington, 19½ cents per yard for the whole work, beginning by November 15, 1882, and using four dredges with a capacity of 10,000 yards a day; Rittenhouse Moore, Mobile, Ala., 27 cents above the Long Bridge and 21.2 below, two dredges, 5,000 yards per day; George C. Fobes & Co., Baltimore, 29 cents below the Bridge only; National Dredging Company, Washington, 34 cents above and 24 below the bridge, taking out 5,000 yards daily; American Contracting and Dredging Company, New York city, 24.75 cents for the whole work; H. W. Beard, Brooklyn, N. Y., 36 cents for all the work; Moore & Wright, Portland, Me., 40 cents above and 36 below the bridge, and Sanford Rose, Jersey City, 21.2 cents per yard for the whole work. The material is to be taken from the river, the Eastern Branch, and Washington harbor, and must be deposited inside of the bulkhead line to be established, thus necessitating the building of extensive tracks all over the flats, most of it on piles, and the employment of dirt cars and railway engines. It will thus be seen that the portion of the flats that is now marsh will be, on completion of the work, a perfect network of piling, to add solidity to the made ground.

THE ELECTRIC LIGHT IN SHANGHAI.

The electric light has now been exhibited in Shanghai for nearly a month, and, judging by the gratifying enthusiasm which the subject has aroused among the Chinese, we may expect to see the new light spread throughout the settlements as fast as the company can furnish the necessary power. The Shanghai Electric Company having successfully raised their modest capital of 50,000 taels, and in doing so being compelled to reject nine-tenths of the applicants for shares, mainly Chinese, at once set to work to erect the dynamo-machine, the dispatch of which from America had been previously arranged. There are now 15 lamps working on the circuit; 4 at the China merchants' lower wharf, rented by the company for the purpose of illuminating their frontage and enabling work upon vessels lying alongside to proceed as easily at night as in the daytime. The light gives comparative immunity from robbery and danger. The number of deaths from drowning in the darkness used to average one a week. The Astor House has in its restaurant, billiard and bar rooms three electric lamps, whose brilliant lustre shining through the open windows attracts an admiring crowd of Chinese, who throng the road till past midnight. Sixteen lamps being the complement of the present machine, nothing more can be done to extend the light until the company's new 40-light machine is erected. The foundations for this and for the 40-horse-power engine with which it will be driven are now being rapidly constructed, and before the end of the month the company will be in a position to respond to the numerous applications for private lamps which are being daily made to them.—*North China Herald.*

NEW BOOKS.

Die Calculation im Maschinenwesen. By A. Messerschmidt. Essen, Prussia, 1883. Price $1.00.

The design of this book is to furnish mechanical engineers and others engaged in the manufacture of machinery a ready means for estimating both the cost of various mechanical manipulations and the total cost of a machine.

Although the book is intended for German practice, many useful hints may be found in it for those of our readers interested in the subject. The principles and formulae advanced are illustrated by numerous practical examples.

COLUMBUS, Ohio, Nov. 2.—The Redfield syndicate tonight signed the contracts with Stearns, Norris & Co. for building the Columbus & Eastern Railway east from this city for 60 miles to the Moxahala coal fields. The road is to be ready for cars Aug. 1, 1883.

ENGINEERS AND ENGINEERING IN OTHER LANDS.

[Specially translated and prepared for the ENGINEERING NEWS.]

A patent has been lately taken out by Dietrich, of Berlin, for an improved roller for asphalt pavements. A great deal of the durability of asphalt roads depends, it is said, on the uniformity of the pressure, which produces evenness of surface. The stampers are so arranged that no part of the road is passed over. The machine can be worked by levers, compressed air, etc. As an economical method for keeping pavements even it may doubtless be useful.

The Corinth Canal has now its monthly bulletin as well as its Panama prototype, and it has even a classical motto—"Licet omnibus adire Corinthum." As there is somewhat of a superfluity of great engineering projects just at present, the circular enumerates the advantages that navigation will derive from the cutting of the canal, and a total of 5,897,000 tons that will use the canal is summed up. The maritime movement of Constantinople in 1879 was upward of seven million tons; that of Greece upward of eight millions, and then the Italian ports, Marseilles, etc. The length is only 6,343 metres, and the contract price, including bridges, telegraphs, etc., 24,600,000 francs. Some 800 workmen are now employed, and 250,000 cubic metres per month will be excavated. Mr. Gerster is the chief engineer in Greece; he surveyed the Darien route in 1877. M. de Lesseps is, however, president of the Managing Board, although General Turr is the acting president.

A general survey of France will doubtless be soon begun; a vote of 500,000 francs was asked for by the Minister of Public Works, but the examining committee believed that it should take in the first place the form of a law. The French Etat-Major, M. Bourdalone (1857 to 1864) and the Ministry of Public Works (1878) have furnished excellent materials for the work. Thirty-four of the departments have voted 1,200,000 francs for the purpose, and the services of local engineers will be largely availed of. Some 7,000 persons will, in fact, be employed, and the expense is estimated at nearly 27,000,000 francs, from which the value of instruments already possessed by the state and the services of government employés must be deducted, leaving net cost of 19,0.0,000 francs. If the War Department, which has a general map on the scale of $\frac{1}{80000}$ in hand will combine its operations with the civil undertaking, a very remarkable work can be produced. It is proposed to somewhat popularize the results in the form of a graphic index, published in small sheets, each to include a commune, thus rendering great aid in laying out water-works, new roads, etc.

The state surveys of the different European countries are anything but complete, even at this late day. An interesting article in the *Genie Civil* gives a review of them from which we condense the following:

The Ordnance Survey of Great Britain was first begun in Ireland in 1824. The scale was $\frac{1}{10560}$ with level curves. The whole of Ireland and a portion of Scotland have been surveyed in this way. Initial leveling was first made by special operators, and each county was crossed by one or two lines at least. The parish maps are on a scale of $\frac{1}{2500}$, and the county maps on that of $\frac{1}{10560}$—these latter give the figures of the benchmarks in the buttes of a foot and the leveling curves. Only maps for one-third of England and two-thirds of Scotland are yet ready.

In Belgium levelings have been made by the Ministry of War, and the cadastre reduced to the scale of $\frac{1}{10000}$ serves as a basis for the plane tables, which are estimated by the triangulation. The planimetry is verified and completed with the greatest care on the ground by officers. The curves are printed in chromolithography on a scale of $\frac{1}{10000}$, and reductions at $\frac{1}{20000}$ in ordinary ink.

Switzerland is now nearly completely surveyed, and some very fine work has been done in the way of initial leveling. The Goldschmidt barometer is used for inaccessible parts. The scale is $\frac{1}{25000}$ for the high mountainous region and $\frac{1}{50000}$ for the remainder of the country. The surveys since 1868 have been undertaken by private parties, the remuneration being 35 francs per square kilometre for the latter scale and half that amount for the former. An engineer can do about 104 kilometres during a season. There are 112 maps on the small scale and 440 on the large scale. Some Cantons have begun surveys at $\frac{1}{17500}$ with horizontal sections, and reductions have been made on a scale of $\frac{1}{100000}$.

We find that in Germany there are three divisions, viz.: North Germany, Wurtemberg and Bavaria. The Prussian Etat Major is publishing maps on a scale of $\frac{1}{25000}$, and 320 out of 1,250 have been already issued. In Wurtemberg the work is undertaken by the royal commission for railway construction, and a scale of $\frac{1}{25000}$ has been adopted. 50 maps out of 713 are published. The Bavarian Etat-Major has published 73 maps out of the contemplated total of 901. The scale is the same as for Wurtemberg.

Denmark, though a very flat country, has undertaken a survey with leveling curves at an equidistance of ten Danish feet, and 35 maps out of 135 have been issued. The scale is $\frac{1}{20000}$.

The survey of Italy is yet in a backward state, only some 20 maps have been completed. The plane board, with a scale of $\frac{1}{50000}$, has been adopted.

A very careful survey is being made of Spain with curves at 20 metres. An initial survey, completed by a secondary and a network of crossings at distances of some 600 yards. The scale is $\frac{1}{25000}$. The work is under the direction of General Hanes.

The survey maps for Austro-Hungary will be on the scale of $\frac{1}{25000}$; the old maps were on that of $\frac{1}{144000}$. The equi-distance for curves varies from 100 metres in the mountainous districts to 20 and even 10 metres in level grounds, and to 5 metres in the vicinity of large cities. Some 270 sheets out of 720 have been published.

The relative purity of glycerine is of great importance to engineers, for now, owing to the great demand for the article and the higher prices, adulterations are often practiced. In addition to this want of care in manufacture, is the cause of many impurities remaining, among which are oxide of lead, lime and butyric acid. French perfumers test glycerine with nitrate of silver; if it does not become muddy or change color within 24 hours, it is considered as of good quality. The chloroform test is made by mixing equal parts of chloroform and glycerine, shaking them well and letting the mixture rest. The upper layer is pure glycerine; the lower is chloroform, but containing all the impurities; if there are none, the chloroform undergoes no change. By adding a few drops of sulphuric acid diluted with equal parts of glycerine and distilled water, and then with a little alcohol, the presence of lime or lead is indicated by a white precipitate. The lead can be demonstrated by a current of hydro-sulphuric acid. Butyric acid is tested for by mixing the glycerine with absolute alcohol and sulphuric acid at 66° Baumé; on gently heating, the acid will be recognized by its agreeable odor. Glycerine is often adulterated with sugar, glucose, dextrine and gum. They can be detected by mixing the glycerine with 150 to 200 drops of distilled water, adding 3 or 4 centigrammes of molybdate of ammonia and a drop of pure nitric acid, and then boiling for about 30 seconds. If the glycerine contains any sugar or dextrine the mixture turns blue. Glycerine adulterated with cane sugar or syrup, takes a brownish black color when boiled with sulphuric acid. Glucose is detected by boiling with caustic soda, when the mixture turns brown.

CANALS.

THE idea of piercing the Isthmus of Malacca, which is a matter of considerable interest in France, is being actively pursued. The French Consul at Siam, Dr. Harmand, the celebrated explorer of the Indo-Chinese peninsula, has just surveyed the ground, with the co-operation of the King of that country, and has reported that the scheme is perfectly practicable. The King, it is stated, has expressed his willingness to make a concession to M. de Lesseps.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 373.)

CCCXCIX.—AMHERST, MASS.

Amherst, Massachusetts, in lat. 42° 20' N., long. 72° 30' W., is on the Connecticut River, in a rolling and rocky country.

Settled in 1721, it was incorporated in 1759. Amherst College was founded in 1821.

Water-works were built for a private company in 1879 by Goodhue & Birnie, after plans of Phinehas Ball, C. E., taking the supply from Mill River, a stream of about 3 square miles water-shed. A dam of stone masonry 150 ft. long, 19 ft. high, 8 ft. wide at top and 20 ft. at bottom, forms a storage reservoir of 1,000,000 gallons capacity at 150 ft. above the college, and 330 ft. above the lower part of the village, to which the water is conveyed by 20,000 of 12 in. cement-lined wrought-iron pipe. Distribution is by 12 miles of the same kind of pipe, of from 12 to 4 in. diameter, with 30 fire-hydrants, 32 gates and 200 taps. The fire hydrants are owned by the town, which pays $1,000 per year for public water. Service pipes are of lead.

The population in 1880 was 4,035. The daily consumption is not known.

The works have cost $60,000. There is no bonded debt. The amount to be paid for water damages is not yet adjusted. E. D. Bangs is the Superintendent.

CCCC.—GUNNISON.

Gunnison, Colorado, in lat. 38° N., long. 107° W., is on the Gunnison River, in one of the parks of the Rocky Mountains.

It was settled about 1876. Water-works were built in 1882 for a private company, by Carroll E. Gray, taking the supply from the Gunnison River, a swift mountain stream, draining about one square mile.

A stone and brick conduit conveys the water 2,000 ft. from the river to the engine-house, where it is pumped directly into the mains by two Worthington duplex steam pumps, of 1½ million gallons daily capacity each. The ordinary pressure maintained is 40 lbs., and the fire pressure 80 to 100 lbs.

Distribution is by 4 miles of cast-iron pipe, of from 12 to 6 in. diameter, with 45 fire hydrants, for which the city pays $1,500 per year. The number of taps is not given. Service pipes are mostly of iron, and some of lead.

The population, which in 1880 was 952, is now said to be about 4,500.

The Gunnison Gas & Water Co. has a capital stock of $200,000, and a bonded debt of $150,000 at 7 per cent. interest. The cost of the water-works is not given, nor the daily consumption. D. J. McCann is the Superintendent.

CCCCI.—HOT SPRINGS, ARK.

Hot Springs, Arkansas, in lat. 35° N., long, 93° W., is on a mountain stream in the valley between Sugar Loaf and Hot Springs mountains, of the Ozark range.

Settled in 1820, it was incorporated as a city in 1874. Water-works were built in 1882 for a private company by Carroll E. Gray, taking the supply from Bull Bayou, which receives the drainage of about ½ square mile of mountain slopes, and on which a reservoir is formed by a masonry dam across a narrow gorge in the rocks. The water is conveyed by a stone conduit 5 ft. high, for 40 ft. to the pumps, and is pumped by a Worthington duplex steam pump to a reservoir holding 1,000,000 gallons, excavated in rock on the mountain 262 ft. above the main street of the town. A high-pressure Worthington engine can pump directly into the mains for fire service.

Distribution is by 6 miles of cast-iron pipe of from 12 to 6 in. diameter, with 40 fire hydrants, 11 gates and 250 taps. The city pays $4,000 per year for hydrants. Service pipes are mostly of lead, with some of iron.

The population in 1880 was 3,000. The daily consumption is not given, nor any financial statistics. H. Moysley is Secretary, and J. H. McGlashen the Superintendent.

(TO BE CONTINUED.)

The receipt of statistics as follows is acknowledged with thanks: From D. S. Thomas, President and Superintendent, statistics and water rates of the water-works of Carthage, Mo. From A. M. Wheless, Superintendent, statistics and water rates of the water-works of Dallas, Tex. From L. F. Olney, C.E., statistics and water rates of the water-works of Middletown, N. Y. From F. F. Forbes and E S. Philbrick, C.E., revised statistics of the water-works of Brookline, Mass. From Goodhue & Birnie, statistics of the water-works of Amherst, Mass. From Carroll E. Gray, Jr., statistics of the water-works of Hot Springs, Ark., and Gunnison, Col. From Oliver Ayers, Superintendent, statistics and water rates of the water-works of Portsmouth, N. H. From S. L. Wiley, statistics of the water-works of Owego, N. Y.

CORRESPONDENCE.

WHICH IS IT?

OMAHA, Nov. 1, 1882.

EDITOR ENGINEERING NEWS:

On page 177 of Trautwine's Engineering Pocket-book, edition of 1881, it is said in the twenty-third line from the bottom, "it is plain that there would be some load which would stretch a uniform bar to twice its original length, *or shorten it to zero or* 0."

I wrote the author and showed to him why the last expression "shorten it to zero or 0" is wrong. Mr. Trautwine answered, and said I seemed "to have overlooked the fact that" he says, "If this were also the case beyond said limit." And finally expresses the hope that his letter "may serve to clear my mind on the subject." I wrote him that his explanation had no such effect whatever; and I claim that the expression, "or shorten it to zero or 0," is a mathematical failure and a practical absurdity which anybody may perform, but nobody insist upon. Engineers, what is your opinion on this? J. E. CASTBERG, Draughtsman.

BROCK'S TRUSS BRIDGES.

340 SOUTH TWENTY-FIRST STREET, PHILA., Oct. 30, 1882.

EDITOR ENGINEERING NEWS:

In the interesting articles which have just been begun in your paper on "Truss Bridges," it is stated that all the information that remains of the earliest patents for bridges is the record of the names of the grantees and the dates. This is not true, since many are described in contemporary publications of the day, and as their early date makes them especially interesting, it would add greatly to the value of the articles if such descriptions were searched for and added. Illustrations of the bridges of Timothy Palmer and Thomas Pope, the patents for which were granted in 1797 and 1807, can be found in Pope's "Treatise on Bridge Architecture," published in New York in 1811, a rare work, of which you gave a description in the columns of your paper some years ago.

Respectfully yours, THOS. M. CLEEMANN.

[We are much obliged to Mr. Cleemann for the above suggestion, and we are glad that it came so promptly. It entails an amount of research on the part of Mr. Brock that he is really not able to give the time to now. But we hope that Mr. Cleemann and other engineers who are familiar with bridge literature will follow up Mr. Cleemann's suggestion and give to our readers the benefit of their present knowledge. The subject is an important one, and in this first venture into a new field of engineering research we invite liberal criticism and suggestion, so that our readers, who are the parties we are trying to please, may secure the greatest profit and satisfaction.—ED. ENGINEERING NEWS.]

THE MARKETS.

[From the Iron Age.]

NEW YORK, Nov. 1, 1882.

In most departments of general trade there is a dullness not readily accounted for, but there is a proneness to attribute any temporary feeling of disappointment to unseasonable weather, or the distraction caused by political discussion. Both in the city and country at large there is a slight decrease in the volume of traffic—manufacturing points alone excepted—as indicated by the Clearing House exchanges, and the freight movement by rail shows some falling off. From Chicago eastward shipments are increased compared with the previous week, but the official statement shows a decline of 20,620 tons, or 44 2-10 per cent. from the shipments of the corresponding week last year. Despite these indications the general prosperity of the country is in no degree abated; labor in every section is actively employed; in the absence of speculation business is done on a conservative basis, with close credits; and, withal, food supplies and other exportable commodities are abundant.

Money is easy at 4@6 per cent. on call; prime mercantile paper, 6@6½ per cent.; four months' acceptances, 6½@7 per cent.

Rails.—Some inquiry for steel rails is reported, but no new business. We quote steel at mill, $45@$46.

Old Rails.—Sales during the week include 500 tons D. H. at $30.50 and 1,600 tons old bridge rails, said to be at $28. Of Ts the only business we hear of is in small parcels, for which full figures were obtained. We quote: Ts, $27.50@$28; D. H., $30@$31.

PHILADELPHIA, Oct. 31, 1882.

Plate and Tank Iron.—There is nothing very encouraging in the immediate outlook, so that prices may be considered weak and irregular as follows: Tank iron, 3@3.25c.; Shell Iron, 3.8@4c.; Flange, 4.75@5c., and Fire-box, 5.75@6c.

Structural Iron.—The demand has been fair, and prospects of additional business within a few days seem to be good. Several contracts for bridge work are about being closed, and there is every reason to expect plenty of work in this department. Prices are very steady, and may be quoted same as last week, viz.; 3c. for Angles, 3.85@4c. for Tees, 4c. for Beams and 4.2c. for Channels.

Wrought-Iron Pipe.—Prices are rather weak, and orders for Gas and Steam Pipe have been taken at 57½ per cent. to 60 per cent. discount, and for Boiler Tubes at 47½ per cent. to 50 per cent. Large orders are said to have been taken for some sizes at still heavier discounts, and the entire line is weak and irregular.

Railway Fastenings.—Spikes are in fair demand at about 2 9@3c., but no very large lots could be placed at these figures. Fish Plates are quoted 2.5@2.6c., but there is not much business doing.

PITTSBURGH, Oct. 31, 1882.

Wrought Iron Pipe.—The mills are still well supplied with orders and are likely to have all they can do until the close of the year. The large production, however, is, as might be expected, having its effect in easing up prices, and will again increase discounts. We now quote at 62½@65 per cent. off on gas and steam pipe, and 47½@50 per cent. off on boiler tubes; oil well tubing, 20c. per foot, net; do. casing, 70c. per foot, net.

Railway Supplies.—There is a moderate business at former prices. Spikes, 3c., 30 days; splice bars, 2.50c.; track bolts, 3.75c. with square, and 3.90@4c., with hexagon nuts.

(From the American Manufacturer.)

ANGLE IRON.

[Carnegie Bros. & Co., Limited.]

(*Net f. o. b. cars, Pittsburgh.*)

	Cts.
Equal sided—¾x¾ to 1x1 to 1¼x1¼ in.	3½
" " 2x2 to 4x4	3¼
Unequal sided—2x1¾ to 4x6 in.	3¼
Square root angles—1x1 to 6x6 in.	3¼
Star iron—1¼x1¼ to 4x4	3¼
Sash iron—¾x¾x3-16	3½
Various shapes	3¼ to 4

TEE IRON.

1 inch and upward	3¼

BEAMS AND CHANNELS.

Solid wrought-iron beams—	Cents.
3 in. to 10½ in. x30 ft. per lb.,	4
12 in. by 30 ft. "	4
15 in. by 30 ft. "	4
Deck beams—7 in. to 9 in. by 30 ft. "	3¾
Channel bars— 1 in. to 12 in. by 30 ft. "	4.2
" " 15 in. by 30 ft "	4.2

PLATE IRON.

	Cents.
Universal mill plates—plates not over 36 in. wide by ¾ in. thick and upward ..per lb.,	3¼

BRAZILIAN EXCHANGE.

Oct. 4, 1882.

Par value of the Brazilian mil reis (1$000), gold	27 d.
Par value of the Brazilian mil reis (1$000) gold in U. S. coin at $4.84 per £1 stg.	54.45 cents.
Par value $1.00 (U. S. coin) in Brazilian gold	1$837
Par value £1 stg. in Brazilian gold	8 880
Bank rate of exchange on London to-day	21 1/8
Present value of the Brazilian mil reis (paper)	780 rs. gold.
Present value of the Brazilian mil reis in U. S. coin at $4 80 per £1 stg.	42.12½ cts.
Value of $1.00 ($4.80 per £1 stg.) in Brazilian currency (paper)	2 374
Value of £1 sterling, currency (paper)	11 395

RIVERS AND HARBORS.

WORK has been commenced on the harbor at Kenosha, Wis., by Messrs. Knapp & Gillen, the contractors.

SURVEYING THE MISSISSIPPI.—NEW ORLEANS, Oct. 30.—A special to the *Picayune* from Vicksburg says: "Assistant Engineer Wheeler is here in charge of the boats Illinois and Kentucky, of the River Commission, with a surveying party of 40 men. They will leave to-morrow for a point seven miles below the city. They will make a topographical survey of the river as far down as Natchez."

ENGINEERING NEWS
AND
AMERICAN CONTRACT JOURNAL.

Tribune Building, New York City.

GEO. H. FROST.....EDITOR AND PROPRIETOR.
S. D. V. BURR.....ASSOCIATE EDITOR.

SATURDAY, NOVEMBER 4, 1882.

EDITORIAL ANNOUNCEMENTS.

Terms of Subscription.—To the United States and Canada, $4 per annum, including postage; all parts of Europe, $5, payable in advance. Remittances at the risk of the subscriber, unless made by registered letter or by draft, check or P. O. order, payable to GEO. H. FROST.

Terms of Advertising.—One inch, 12 lines, one insertion, $2; one month, $6.50; three months, $17; six months $30; one year, $50. Special rate for large space and long time will be given on application. Advertisements inserted for less than three months, payable in advance; for longer time, payable quarterly.

Articles for Publication in the current number should be received at the office of publication not later than Thursday morning, and advertisements not later than Friday noon.

Correspondence upon subjects which naturally belongs to the province of this journal is solicited.

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A SUCCESSFUL ARTESIAN WELL.—About one year ago several enterprising citizens of Mount Vernon, N. Y., formed a corporation for the purpose of obtaining an adequate supply of pure water. After thoroughly studying the various systems of obtaining water, they decided to sink an artesian well, reasoning from analogy that as wells in similar geological formations yielded bountifully, their chances of striking a water-bearing crevice at a reasonable depth, were good. Geologically considered, the structure of Westchester County closely resembles that of Manhattan Island, and with but two or three exceptions, wells sunk on the island have been successful. A contract was made for the sinking of a well eight inches in diameter, and from 300 to 700 feet deep, according to the supply. On the 23d ult. the well was finished at a depth of 502 feet. A wrought iron tube was driven through the surface to a depth of 30 feet when it struck solid rock. As the water rose above the surface, the well may be considered as a flowing one. The water was found to be soft, clear and cold. A pump was attached, and when running at the rate of 100,000 gallons a day, was unable to diminish the supply. It is calculated that this is sufficient for 3,000 or 4,000 people. The well is about 130 feet above tide water. With an expenditure of not more $75,000 for pumps, pipe, well, etc., a sufficient supply will be obtained for both domestic and fire purposes.

EARLY AMERICAN BOOKS ON SURVEYING.

The surveying done during the eighteenth century in the American woods was, as every one knows, of a rude and elementary character. There was no American literature and little American science. When William Penn wished to run the boundary line between Maryland and Pennsylvania, he was obliged to send to England for two surveyors to do the work. The methods used in land measuring were almost entirely taken from English practice. The compass was the only instrument used for measuring angles and determining directions. Almost the only contribution of the century to surveying science was the method of computing areas from compass surveys by means of latitudes, departures and double meridian distances. This was the work of David Rittenhouse, the Pennsylvania mathematician and astronomer, who, like Benjamin Franklin, seems to have been almost alone in his solitary studies.

Of course, the books used in these early times came from England. Dix, Love and Gibson appear to have been the authors most read. In 1780 or thereabouts a reprint of Gibson was published at New York, wherein, says the title page, "everything that is useful and curious in the art of surveying is fully considered and explained." Gibson seems to have been a favorite work, for various editions and revisions were issued during a period of forty years. The edition of 1798 boasts of containing "alterations and amendments adapted to the use of American surveyors," which mainly consisted in the addition of the Rittenhouse, or Pennsylvania method for computing areas.

At Wilmington, Del., appeared in 1799 "a compendious treatise on practical surveying, concisely defined, methodically arranged and fully exemplified, by Zachariah Jess, schoolmaster." It contained 212 pages of text and 152 of tables, and in spite of its boastful title-page was really a very excellent book and one that shows its author to have been a careful and painstaking man. The logarithmic tables have five decimals only, and in that respect are far better than those in the text books of the present time.

Very soon after, either in 1800 or 1801, Amos Eaton, a botanist and surveyor, printed at Hudson, N. Y., a little 18 mo. pamphlet called "Art Without Science," wherein "mensuration, surveying and engineering are divested of the speculative principles and technical language of mathematics." Copies of this are very rare. In 1830 it was reprinted at Albany in octavo form, revised and enlarged to 96 pages. Its contents are readable and interesting throughout. The author in 1828 became the principal and senior professor of the Rensselaer Institute at Troy.

Abel Flint, of Connecticut, published in 1804, at Hartford, a book with a long title-page treating of trigonometry and surveying, which included, says the preface, "all which is requisite in field surveying, both on the old and new plan." This was a very popular book, and it went through many reprints and editions, the last of which, we believe, appeared in 1852.

John Gummere, of Philadelphia, in 1814, published the first edition of his Surveying, which likewise proved a great success, and the later editions of which are even now, we think, used in some of the schools in Pennsylvania.

There may be, perhaps, other books on surveying published in the later years of the last century or the earlier ones of this century, but they have not come to our notice. Books in those times were books. The purchasers studied and read them with care. The authors spent much thought and labor in improving their successive editions, for stereotyping was then unknown and each new edition was actually a new reprint. After 1840 books on surveying became very common. Every author of a course of mathematical works wrote one, so that to-day their number is legion. Every one of them contains the rectangular method of Rittenhouse for computing areas and the same tedious talk about the variation of the magnetic needle. The picture of Jess showing how to find the height of a tree has become the common inheritance of scores of books, which, notwithstanding the wonderful material progress of the age, are but very little better than his methodical work.

THE IRON TRADE.

Despite the extensive increase of facilities for making iron and steel, consumption of these products is steadily increasing both abroad and at home, and the quotations continue steady in nearly all the markets. This fact indicates a very healthful condition of the trade. Under ordinary circumstances this enormous increase in capacity would be naturally followed by a decline in prices, and by a hesitancy of buyers to push into the market. As it is, however, there is a steady increase in consumptive requirements, and buyers are providing for future requirements in a manner which indicates great confidence in the future steadiness of prices. The long suspension in the summer, of so many mills, has contributed a great deal to this result, and those buyers who have been expecting a break in prices in consequence of resumption have thus far been disappointed. The far West and the Southern States are heavy purchasers of all kinds of iron products. The increase of mining operations, of railroad building and of the general manufacturing industries have all combined to open up a very large market for these products, and especially for machines and machinery, besides tools, hardware and all the finer products. The general condition of trade throughout the West is satisfactory, but as heretofore stated, is not expanding as rapidly as had been expected. Iron manufacturers are hoping for too much and many of them are too sanguine.

Our development is extraordinary and there is no occasion for complaint. We are building nearly 1,000 miles of railroad per month. The locomotive establishments and all the old and new bridge works are crowded with orders for months to come, Railway companies are making liberal expenditures for bridge works and renewal of road, and construction of branch lines, and lateral connections. Motive power is in great request and rolling stock is wanted about as fast as our immense car-making capacity can meet it. There is no cause for complaint whatever, and while we are not on the verge of a boom, nor in any danger of such a calamity, yet there is every indication of very satisfactory industrial activity, and, what is more satisfactory, it presents numerous evidences of being prolonged. In some directions there may be cause for apprehension, as, for instance, in financial matters. It is no use to pay particular attention to the daily and weekly ups and downs of stocks and bonds; but it is advisable for the captains of our great industries to keep in mind the general course of events and the general direction of the influences and tendencies which control the volume of, and demand for money. The scarcity of money is a serious thing. The importance of a sufficient volume of money is, perhaps, not sufficiently considered by American business men. They know how to make, sell and use machinery and all the various products which form the basis of our industrial and commercial activity, but they too frequently ignore the vital importance of a sound financial system, one which will enable them to effect all exchanges without loss. The demand for currency is rapidly increasing while the supply is evidently not maintained in like proportions. The production of gold and silver adds but a small quota of what is necessary. The expansion of the paper currency does not keep pace with the expansion of domestic exchanges as indicated by bank and other returns. Should a stringency occur it will be taken advantage of by those who deal in money and its use. A stringency is likely to be followed by a greater stringency and produce evils which it is desirable should be avoided, in view of our past experience. The iron and steel manufacturers are perhaps more deeply interested in a good financial system than any other class.

The foreign markets for iron are very firm and the recent strikes in the coal and iron trades have brought about an advance of finished iron of from five to ten shillings per ton. Stock are decreasing and the number of furnaces in blast is increasing. At present it is 569 against 547 at the first of the year, with 350 out now against 376 at the beginning of the year. Nearly all markets are firm and buyers are looking forward for stocks which will very likely keep the market firm for a long time to come. The iron workers have secured *their* advance, and the miners theirs in part. Conferences have been held, and it is the intention of the workers to push the agitation for an advance in all parts of the kingdom. The result will be to restrict the exports of iron somewhat for a while, but as it is probable the American market will follow closely on the heels of the foreign, the opportunities

to export iron to this side will still be offered and accepted. All furnaces and mills throughout the country are busily engaged on orders which will likely absorb their out-put to the end of the year. No effort will be made in a general way to provide for next year's requirements until December, when the strength of the market either upward or downward will have been demonstrated.

WHAT GOOD IS IT?

This is the question that a distinguished civil engineer asked us several months ago, in relation to Mr. Croes "History and Statistics of American Water-Works." He remarked that he could not see what the author meant by putting in so many figures that nobody would read. But a few days ago he had changed his tune. He had been called on to testify as an expert about some water-works. He was expected to swear that a certain scheme was feasible and advantageous for a certain place. He was puzzled to know how to prove his case exactly. While he was cogitating how he could evolve out of his inner consciousness facts to sustain his client's side, his weekly number of ENGINEERING NEWS was brought in. He looked over it, and lo! there were full and concise data of a precisely similar case to the one he was to support, proving by facts that such works were feasible and remunerative. He put the paper in his pocket, read it on the cars; swore his swear with ease and effect, and pocketed his fee.

That is where the benefit of these papers is and will be felt. There is not in existence such a collection of facts relating to water-works, divested of all theories and fancies, as is contained in the descriptions of the 400 water-works we have already published.

There are about 250 towns more from which we must have returns. The officers of the works have been again and again appealed to, but they do not respond. Why is this? They may be assured that it is our intention to republish these histories in book form as soon as practicable. We want to do this early in 1883, and the sooner we get in all the returns the sooner will this valuable work be at the service of the committeemen, engineers and contractors who are interested in the subjects treated of. Will not our readers take an interest in getting the desired returns forwarded to us?

WANTED.

We publish below a list of the towns which have been reported to us as having water-works, but which have not yet sent any returns to Mr. Croes. It is possible that there are no works in some of them. We will be glad to hear from some of our readers with reference to every town on the list. If they have no water-works, let us know. If they have, or if there are any others which have, and are not on this list, nor among the 400 already described, we hope that some one will stir up the officials to send a return to Mr. Croes on the blanks he has already sent them, or if, as in one case we know of, the blank was put in the waste basket, that they will send for another, fill it out and return it.

The *Sanitary Engineer*, which is noted for the soundness of its judgment on matters affecting the interests it advocates, feels, as do other professional journals, the want of just such a book as we are now publishing in our columns and hope soon to issue separately. In discussing the question of water rates and the share of the cost of the water-works which ought to be borne by the public at large, it says:

"Whether it is fair to impose on property so large a proportion of the cost of the works, as is done in many towns, is a question worth discussing. The data for a fair discussion have not heretofore been obtainable, but we hope that the volume of Statistics of American Water-Works, by Mr. Croes, which is promised at an early day, will place in a form convenient for analysis all the facts necessary for a full comprehension of this subject."

We hope that every one of our readers will aid us in procuring the data necessary to complete this invaluable work.

Aberdeen, Miss.
Abilene, Kan.
Alliance, O.
Anaheimo, Cal.
Archbald, Pa.
Arlington, Mass.
Atchison, Kan.
Atlantic City, N. J.
Attica, Ind.
Atlantic, Ia.
Augusta, Me.
Austin, Tex.
Baliston Spa, N. Y.
Bayside, N. J.
Belfast, Me.
Bellefonte, Pa.
Belleview, O.
Berthier, Can.
Bethlehem, N. H.
Biddeford, Me.
Birmingham, Pa.
Bodie, Col.
Boyerstown, Pa.
Brampton, Ont.
Brattleboro, Vt.
Brandon, Vt.
Brazil, Ind.
Bridgeport, Conn.
Bristol, R. I.
Brocton, Mass.
Brookville, Ind.
Bryn Mawr, Pa.
Burlington, Vt.
Butler, Pa.
Butte, Mon.
Cadillac, Mich.
Calais, Pa.
Canton, O.
Candelaria, Nev.
Cape May, N. J.
Caribou, Col.
Carlisle, Pa.
Central City, Col.
Chattanooga, Tenn.
Cheboygan, Mich.
Charlestown, Ill.
Chambersburg, Pa.
Cheshire, Mass.
Chillicothe, O.
Clarion, Pa.
Claremont, N. H.
Colorado Springs, Col.
Cohoes, N. Y.
College Point, N. Y.
Columbia, Pa.
Columbia, S. C.
Columbia, Cal.
Columbus, Ga.
Constantine, Mich.
Cooperstown, N. Y.
Coatesville, Pa.
Connemaugh, Pa.
Corsicana, Tex.
Crestline, O.
Crookston, Minn.
Cumberland, Md.
Danville, Ill.
Danville, Va.
Davenport, Ia.
Deadwood, Dak
Dover, N. H.
Doylestown, Pa.
Dunmore, Pa.
Easton, Pa.
Easthampton, Mass
Edgewater, N. Y.
Edmore, Mich.
Ellenville, N. Y.
Emans, Pa.
Ephrata, Pa.
Fair Haven, N. Y.
Farmington, N. H.
Fayetteville, N. C.
Flemington, N. J.
Flushing, N. Y.
Fond du Lac, Wis
Fort Dodge, Ia.
Fort Edward, N. Y
Franklin, Pa.
Fredericksburg, Va.
Fredonia, N. Y.
Freeport, Ill.
Frostburg, Md.
Galion, O.
Garden City, N. Y.
Gettysburg, Pa.
Geneseo, Ill.
Geneseo, N. Y.
Gilroy, Cal.
Glens Falls, N. Y.
Golden, Col.
Grand Island, Neb.
Grass Valley, Cal.
Grand Haven, Mich.
Great Falls, N. H.
Gridley, Cal.
Hackensack, N. J.
Hagerstown, Md.
Hamerton, Pa.
Hazelton, Pa.
Haverhill, Mass.
Holly, Mich.
Honesdale, Pa.
Houston, Tex.
Huntsville, Ala.
Hyde Park, Ill.
Hyde Park, Vt.
Independence, Mo.
Ithaca, N. Y.
Ishpening, Mich.
Jacksonville, Ala.
Jamestown, N. Y.
Jamestown, Pa.
Johnstown, Pa.
Kennett Square, Pa.
Kingston, Ont., Can.
Kingston, Mass.
Kittaning, Pa.
LaCrosse, Wis.
LaPorte, Ind.
Lansford, Pa.
Lakeview, Ill.
Las Vegas, N. M.
Leavenworth, Kan.
Lewiston, Me.
Lewistown, Pa.
Lexington, Va.
Lincoln, Neb.
Lindsay, Ont.
Little Rock, Ark.
Locust Mountain, Pa.
Long Island City, N. Y.
Longmont, Col.
Los Angeles, Cal.
Madison, Wis.
Marion, Ind.
Marlboro', Mass.
Marquette, Mich.
Marysville, Cal.
Maysville, Ky.
Mechanicsburgh, Pa.
Media, Pa.
Medina, N. Y.
Middletown, O.
Milford, Pa.
Milford, Mass.
Minersville, Pa.
Mitchell, Can.
McKeesport, Pa.
Modesto, Cal.
Mobile, Ala.
Monckton, N. B.
Monongahela, Pa.
Montpelier, Vt.
Morganson, Pa.
Morris, Ill.
Mount Morris, N. Y.
Mount Vernon, N. Y.
Muskegan, Mich.
Massillon, O.
Nevada City, Cal.
New Castle, Del.
Norwalk, Conn.
Olympia, W. T.
Oneonta, N. Y.
Orange, Mass.
Oregon, Ill.
Oskaloosa, Ia.
Oxford, Pa.
Parker City, Pa.
Parkersburg, W. Va.
Peabody, Mass.
Perth Amboy, N. J.
Peru, Ind.
Placerville, Cal.
Plattsburg, N. Y.
Plymouth, Pa.
Portland, Mich.
Portland, Or.
Port Jervis, N. Y.
Port Richmond, N. Y.
Portsmouth, N. H.
Pottsville, Pa.
Prescott, Ariz.
Providence, Pa.
Putney, Vt.
Raleigh, N. C.
Reading, Pa.
Red Bluff, Cal.
Renovo, Pa.
Reynoldsville, Pa.
Rock Island, Ill.
Rockville, Conn
Rutland, Vt.
Saginaw, Mich.
Salem, O.
Salem, N. J.
San Jose, Cal.
St. Joseph, Mo.
San Antonio, Tex.
St. Cunegonde, Can.
St. Gabriel, Can.
St. Peter, Minn.
St. Thomas, Can.
San Rafael, Cal.
Santa Cruz, Cal.
Santa Fe, N. M.
Silver Cliff, Col.
Seaforth, Can.
Seattle, W. T.
Shamokin, Pa.
Shelburn Falls, Mass
Shelton, Conn.
Sherman, Tex.
Shenandoah, Pa.
Sorel, Can.
South Adams, Mass.
Springfield, Ill.
Stamford, Conn.
Sterling, Ill.
Steubenville, O.
Stockton, Cal.
Stonington, Conn.
Summit Hill, Pa.
Sycamore, Ill.
Suspension Bridge, N. Y.
Tamaqua, Pa.
Tecumseh, Mich.
Tiffin, O.
Topeka, Kan.
Towanda, Pa.
Tower City, Dak.
Tyrone, Pa.
Union City, Ind
Vergennes, Vt.
Wakefield, Mass.
Washington, Ind.
Walton, N. Y.
Washingtonville, N. J.
Watsonville, Cal.
Walkertown, Can.
Walla Walla, W. T.
Warren, Mass.
Warren, O.
Warren, Pa.
Waterville, Me.
Wayland, Mass.
Wellsville, O.
West Brookfield, Mass.
Westminster, Vt.
Whitehall, N. Y.
Wheeling, W. Va.
Windsor, Can.
Windsor, Vt.
Winnipeg, Man.
Winchester, Va.
Wolcottville, Conn.
Woodford, Cal.
Yarmouth, Can
Yorkville, Can.
Youngstown, O

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

THE $40,000 worth of bonds recently issued by Asheville, N. C., for macadamizing the principal streets and establishing water-works, have been sold at par. The committee has commenced upon both of these improvements.

MAQUOKETA, Ia., is going to have water-works.

PULLMAN, ILL.—The amount of water used each day is 560,000 gallons. This is the source of a handsome revenue to the village of Hyde Park, as by contract with the Pullman Company, the latter corporation is to pay to the village $50 per million gallons, which, at the present rate, will amount to over $850 per month, or over $10,000 per annum.

THE gates through which Jersey City supplied Hoboken with water have been closed. Hoboken has made a new contract with the Hackensack Water Company for a water supply. Jersey City loses $80,000 per year by the change.

THE Murphysboro (Ill.) Coal-Gas Company has been incorporated; capital, $40,000.

LAKE VIEW, ILL., has passed ordinances for the buying of 4 and 6-inch water pipes.

THE WATER-WORKS extension at Toronto, Canada, has been completed. A pipe 6 ft. in diameter runs out into the lake about 2,600 ft. to deep water. It was laid in lengths of 100 ft. The water obtained is pure and clear.

IOWA CITY, IA., will soon have the Holley system of water-works in operation.

ELECTRICITY.

THE Phœnix Electric Company of Chicago, Ill., has been incorporated. Capital, $250,000.

PROGRESS OF ELECTRICITY.—The Chesterfield Town Council have resolved to apply to the Board of Trade for power to supply the town with the electric light.—An installation has just been completed with Swan lamps and Faure accumulators in the Paris Opera-house. The representatives of the Opera-house have expressed themselves extremely pleased with the result. All the main cables are covered with lead, and every lamp is protected with lead cut-outs to avoid any possible chance of fire.—The extensive premises known as Waterloo House, Trafalgar Square, have just acquired a very successful installation of 16 arc electric lights, which have been furnished by the Metropolitan (Brush) Electric Light Company, the power-generator being a 12-horse power (nominal) Otto gas-engine.—Pentonville Hill, Clerkenwell, is now illuminated with 82 incandescent lamps, supplied by the Maxim-Weston Electric Lighting Company.—Siemens & Co. have recently received instructions to extend the electric lighting installation at the Royal Albert Dock, so as to include the south side of the dock.—*The London Ironmonger.*

RAILROADS.

A SCHOOL-CAR.—The Central Hudson Company is building at West Albany, N. Y., a "school-car," to be used in teaching engineers how to handle the Westinghouse air-brake. Every passenger engineer will be required to have a certificate of instruction.

ROAD INCORPORATED.—Articles were filed at Albany on the 1st by the Lackawanna & Pittsburgh Railroad Company, capital $4,000,000. The road is to begin at a point on the Genesee Valley Canal Railroad, at or near Rockville, running thence in a northeasterly direction by the most feasible route to a point on the New York, Lackawanna & Western road, at or near the village of Perkinsville, with a branch beginning at a point on the line of the Lackawanna & Pittsburgh Railroad at or near the intersection of the railroad with the boundary line between the counties of Alleghany and Steuben, running thence in a southeasterly direction by the most direct route, by way of the village of Hornellsville, to a point near the village of Canisteo. The length of the branch is to be 16 miles, and that of the main road 42 miles.

THE VIENNA ELEVATED RAILWAY.—The *Neue Freie Presse* states that the Austrian Government has determined to grant the concession for the Vienna Elevated Railway to the English Company Fogerty. The municipality and magistracy of Vienna will only now have to discuss the question of technical construction. The line will be concessioned as an elevated railway, and the entire iron required for the construction—from 150,000 to 180,000 tons—will be furnished by works in Austria. A contract for the greater portion of this quantity has already been concluded with the Wittkowitz Iron Works.

THE Lebanon Valley (Pa.) Railroad is being laid with steel rails.

THE TOLEDO, CINCINNATI & ST. LOUIS RAILROAD has purchased 113 acres of land in St. Louis, and will build depots and warehouses.

EXTENSIVE WORKS for the manufacture of rails, rods, bars, etc., are to be built at Murphysboro, Ill. There will be 35 buildings, covering 65½ acres; the whole to be completed within four years, and to cost $5,000,000. The works will include six blast furnaces, double steel works, rail mill, plate mill, universal mill, blooming and billet mill, iron and brass foundry, and hoop, cotton tie and bar mills. Some 2,500 workmen will be employed.

BUILDING OPERATIONS IN MEXICO.—CITY OF MEXICO, Oct 31.—The City Architect reports 2,000 houses inside the corporation limits as being built or undergoing repairs. Several parties are speaking of constructing a large American hotel.

THE Hurricane Granite Company recently advertised

for 100 granite cutters at Hurricane, on an eight months' job.

A SURE cure for chapped hands is something greatly to be desired by stone-cutters. Try this: Wet your hands in warm water, then rub them all over with Indian meal; do this twice, then in the water used to wash off the meal put a teaspoonful of pure glycerine. If it is not pure, it will irritate the skin.

THE laying of the track for the Wisconsin Central Railroad, between Neehah and Oshkosh, has just been completed.

NEW GEORGIA RAILROAD.—The Augusta, Elberton & Chicago Railroad Company has been organized at Augusta by electing James P. Verdery, president; H. J. Lang, vice president, and H. P. Moore, treasurer.

ARTICLES of incorporation have been filed in Little Rock, Ark., for the Dardanelle & Waldron Railway Company, with $750,000 capital, and the road will be 75 miles long.

BRIDGES.

NEW BRIDGE.—The Chicago & Alton road is building a new iron bridge over the Kankakee River, between Joliet and Coal City. It is to be 1,000 ft. in length, and will be completed in about a month.

GRANITE FOR THE BROOKLYN BRIDGE.—From an exchange we take the following:

The list of the firms which have supplied granite for the East River Bridge, New York, down to the close of the granite account, with the amount paid to each firm, is as follows:

Bodwell, Webster & Co.	$56,163.63
Bodwell Granite Co.	19,031.94
Bodwell Granite Co. (2d contract)	535,594.85
Cape Ann Granite Co.	74,840 83
Collins Granite Co.	325,452.17
Pierce, Rowe & Co.	151,929.66
Pierce & Rowe	6,863.33
John T. Rowe	5,877.92
Beattie & Dresser	20,087.98
John Beattie	11,032.05
Rhode Island Granite Co.	14,880.52
Joseph Wescott & Sons	10,841.11
Joseph Brennan	8,532.04
C. J. Hall	4,517.70
C. P. Dixon	611.82
Concord Granite Co.	45,318.35
Eagle Quarry Co. Assignees	2,230.00
C. C. Burrell	2,200.00
Since Jan. 1 to May 1, 1881, the following money has been paid for granite to various firms in small sums (including the Bodwell Granite Co.)	22,160.00
Total	$2,118,196.90

BRIDGE FINISHED.—SAVANNAH, Ga., Oct. 30.—The iron bridge over the Savannah River was completed at 5 o'clock this afternoon. It cost $100,000.

BRIDGE TO BE WIDENED.—The Commissioners of Norfolk County, Mass., have granted the petition of the Boston and Providence Railroad Company for permission to widen the bridge over River street in Hyde Park, and specify that the bridge shall extend across the whole railroad location, and shall be 50 ft. wide, 18 ft. in height above the tracks, and to be of wrought iron, with two trusses of 78 23-100 ft. span placed 31 5-10 ft. between centres, and each truss placed so that its centres shall be 9 25-100 ft. from the line of the street.

THE LARGEST ARCH.—The dimensions of the union arch of the Washington aqueduct, it would appear, exceed those of any of the celebrated engineering structures which are most commonly pointed to as wonderful achievements in masonry. The entire span is 220 ft., or 20 in excess of the span of the famous Chester arch across the Dee in England; 68 ft. longer than the central arch of London bridge; 92 ft. longer than the noted bridge over the Seine at Neuilly, and 100 ft. longer than the arches of the Waterloo bridge over the Thames. The height of the Washington arch is 101 ft.

BUILDING.

WORK has begun upon the foundation of the new machine shops in Bath, Me. The buildings are to be 60 ft. wide and the dock filled in even with the river front of the wharf.

PROPOSALS FOR HEATING APPARATUS.—Jas. G. Hill, supervising architect of the Treasury, will receive proposals until Nov. 22, 1882, for furnishing and placing the low pressure steam-heating apparatus required for the post-office and sub-treasury extension, Boston, Mass.

A BIG DEPOT AT MONTREAL.—The Canadian Pacific directors and a committee of the Montreal Corporation came to an arrangement recently for the erection by the former of a monster depot, costing $2,000,000, in the east end of Montreal. The Council will contribute $200,000 cash, in addition to 225,000 square feet of valuable city property as subsidy.

LITERATURE.

The publisher of the Kansas City *Review of Science and Industry*, a 64-page monthly devoted to Progress in Science, Mechanic Arts and Literature, offers the remaining half of vol. VI. for $1, the subscription for the volume being $2.50.

CONTRACTS LET.

IT is reported that the Bodwell Granite Company, at Vinalhaven, Me., have secured the contract for a large building to be erected in Chicago. It is a two years' job for the present force of cutters.

THE contract for about 30,000 tons of rubble stone for the breakwater in the Rockland (Me.) harbor, has been awarded to John F. Hamilton, of Portland, the lowest bidder. It is understood that work will be resumed on the job this fall, and continued so long as the weather remains moderate enough to permit.

RAILROAD CONTRACT LET.—Major A. J. Twiggs, of Augusta, Ga., has made a contract with the directors of the Georgetown & Lane's Railroad Company for the building and equipment of a railroad from Georgetown to Lane's depot, on the Northeastern Railroad in this State. The length of the line is 38 miles, and the construction of the road will give Georgetown her only railway connection and open up a fine country. The work is to be completed by Nov. 1, 1883. The contractor is to receive a private cash subscription of $25,000 made by the municipality of Georgetown, and first mortgage bonds of the railroad company sufficient to cover any additional cost of construction that may be incurred.

GRANITE CONTRACT LET.—The following are the bids for furnishing cut granite for the approaches of the north wing of State, War and Navy departments building:

Elsworth & Blue Hill Granite Co.	$52,597.00
M. K. Chase	53,065.00
Collins Granite Co.	56,186.92
Davis Tillson	59,648 17
Old Dominion Granite Co	63,593.00
Gill & McMahon	67,223.00
Concord Granite Co.	69,957.00
Cape Ann Granite Co.	69,681 35
Bodwell Granite Co.	73,310.00
Mt. Waldo Granite Works	89,804.00

The contract has been awarded to Davis Tillson, the lowest bidder submitting a sample of granite fulfilling the requirements of the specifications.

CONTRACT FOR GRANITE FOR BRIDGE PIERS.—The bids for the piers for the new iron bridge at Lowell, Mass., were three, as follows: W. H. Ward, $59,522; O'Hearn Bros., $61,529; Runels & Trumbell, $61,663. The contract was awarded to Mr. Ward. He is to remove the present piers, put a new one where the present northerly one stands, and another a few feet north of the southerly one. The new ones will be set on 114 piles each, these being sawed off four or five feet below low water mark, and enclosed with a curb of sheet piling and concrete. The piers will be twenty-six feet above low water mark, built of cut stone. Much of the material of the old piers will be used in the new ones. The abutment between the Massachusetts and Boott's mills will have to be carried out twenty-five feet into the stream, to coincide with the wall of the extended Boott mill. The work is to be done by Feb. 1, 1883, ready for the iron superstructure.

MISCELLANEOUS.

LUMINOUS PAINT.—A party of gentlemen recently made a trip on the Southeastern Railway, in England, with the object of testing the luminosity of a railway car, a portion of the interior of which had been coated with Balmain's patent paint. The weather being dull, the zinc plates, which had received three coats of the paint specially hardened, were less sensitive than would have been the case had sunshine struck directly upon them: but, notwithstanding, on entering Blackheath tunnel, an agreeable, equally-diffused light proceeded from the ceiling of the compartment and the two ends, the advertisements on which were seen clearly. The hands of a watch were also easily discerned, and the headings of newspaper articles read. Containing no phosphorus, the paint was without smell.

TRUSS-BRIDGES.*

AN ILLUSTRATED HISTORICAL DESCRIPTION OF ALL EXPIRED PATENTS ON TRUSS-BRIDGES, WHICH UNDER THE LAW ARE NOW PUBLIC PROPERTY AND FREE TO BE USED BY ANY ONE.

By F. B. Brock, Patent Attorney, Washington, D. C.

One year afterward another patent for a bridge was issued. It was granted Feb. 3, 1834, to one Jonas Snyder. This bridge consisted of double wooden chords between which the posts or uprights were placed running up to the top of the bridge and about eight feet apart. These posts were set so as to lean outward toward the two ends of the bridge at different angles of inclination, as shown in the illustration. The first or lower arch was arranged to spring from the pier about four or five feet below the chords. The second, or arch just above, was constructed precisely like the lower one, but sprang from the end of the bridge immediately above the chords. The arch pieces curve, as seen in the bottom view of the bridge. A small inter-tie may be put in with tenons from post to post along the length of the bridge.

January 23, 1836, Stephen H. Long, United States Topographical Engineer, devised a bridge, the object of which was "to produce and insure lateral stiffness or inflexibility in wooden or frame bridges." This object was effected, as shown by the drawings, by means of a system of "lattice" bracing, applied either to the upper or lower strings or chords of the bridge, or to both, as was deemed advisable. The lattice bracing was to consist of timbers about 3 by 9 to 12 inches transversely, and of any appropriate length, applied diagonally either above or below the strings, an application to the upper strings being deemed preferable. They are attached to the chords by bolts, spikes or treenails, passing through the brace timbers at their intersections and through the strings or chords at the places where the two are attached. The arrangement of the brace timbers is such as to exhibit two sets of braces, one antagonal to the other, the timbers in each set being parallel to each other, or nearly so. The arrangement also provides that one set of the braces shall rest or recline upon the other in such a manner that the ends of the braces of one set shall rest immediately upon the ends of the other set. The brace timbers of each set are confined to those of the other set, at every intersection, by similar fastenings.

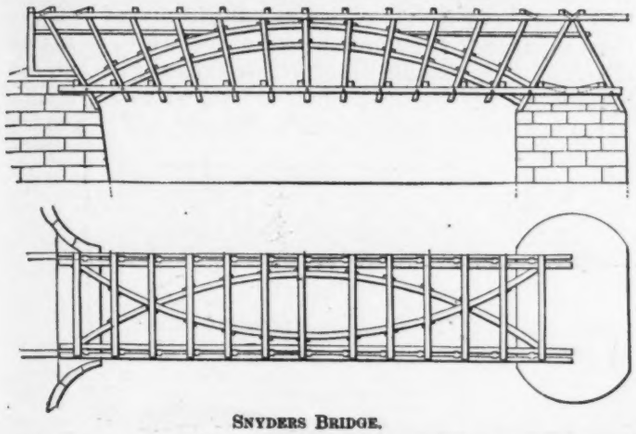
In the use of lattice bracing to the upper strings of a bridge, the necessity of beams to confine the strings together, and to afford the requisite supports for roofing, is entirely obviated. A beam, however, is required over each pier and abutment to serve as a band for the lateral bracing, and more especially to afford the means of introducing transverse braces to better advantage.

Fig. 1 of the drawings is a side view, Fig. 2 a plan, and Fig. 3 an end view. *A* is the upper set of lateral braces; *a* the ends of the same. *B* is the lower set, and *b* the ends thereof. *C* are the binders; *D* the beams over the abutments and piers, with their stay braces *C* the bolsters for sustaining the bridge, and *F* are iron stay braces for bracing the bridge transversely.

Francis Good, of Pennsylvania, next appears as an applicant for protection in truss bridges. His papers bear date Nov. 4, 1837, after the reorganization of the Patent Office from the fire of 1836. Taking the drawings into consideration his devices may be described as follows: Having turned the water off from the place where it is intended to construct the bridge, the bottom is prepared to receive two horizontal

* Copyright, 1882.

sills *A A*, one placed on each side of the stream. Upon these sills are the walls *B B* raised to a suitable height, which are to sustain the superstructure, and for preserving the banks, built of stone, about 2 feet thick, and sloped at the banks against stream. Parallel plates *C C* are placed upon the walls, and the transverse beams *D D* over these; near the ends are arranged plates of iron *E E*, and bolted thereto. *F* is the flooring. The bolts *G* pass through the whole structure, and secured by a key *H* passing through a mortise in its upper end. Over the sloped part of the walls is laid an iron plate *I*. At its lower end it is secured by a short bolt *J* passing through the sill and through the iron plate, secured by a key *K* on the top of the sill. The ends of the flooring planks are covered by a sheathing board *L*, and the transverse beams likewise by boards *M* to protect them.



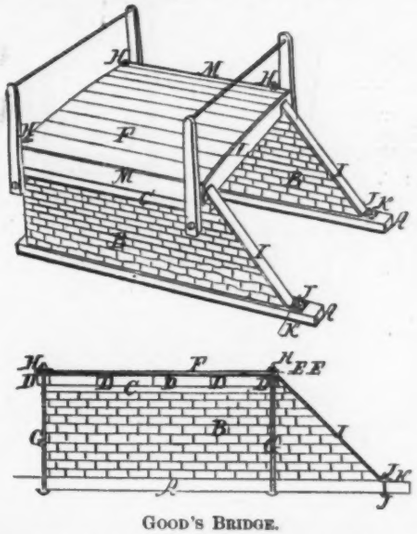
SNYDERS BRIDGE.

June 24, 1839, Henry Wilton, another Pennsylvanian, received a patent for a railway truss bridge. The nature of this invention was the combining of a right line or horizontal with an arch bridge in a novel manner.

In the plates, Fig. 1 is a side view of the bridge; Fig. 2, plan of the lateral bracing; Fig. 3, section through the line *A' B'* of Fig. 1; Fig. 4, section through the line *C' D'* of same figure, and projection of the arch.

A represents the latticed trusses, and *B* its chords. *C* are the lower transverse beams, and *D*, the upper transverse beams. *E* is the lateral bracing between the beams. *F* are the arches, and *G* the suspension bars. *H* are the stirrups at the lower ends of the suspension bars, and *I* represent the horizontal brace bolts; *K*, the abutments. *L* represents the railway on the top of the bridge, and *M* a section of a railway on the lower beams.

The trusses of this railroad bridge are composed of sma pieces of timber crossed at an angle of about 47°, pinned together and having parallel string pieces or chords. The arches are arranged on both sides of the trusses. The bridge is extended in length beyond the abutments for the purpose of producing a counter-balancing weight. The number o lattice pieces in this bridge is about one-fifth less than i



GOOD'S BRIDGE.

usually put in a right line bridge, this reduced quantity of timber being in part supplied by the introduction of the segment arches combined with the horizontal trusses, and bearing endwise against the abutment.

This bridge, it is claimed, is stronger and bears a greater weight at a point where the right-line bridge, on the lattice principle, is weakest, namely, in the center of the span, whereas by this construction, the bridge, at this point is strongest, because the arch which supports it from sinking in the center, is strongest and will bear a greater weight at the vertex than at any other point. This mode of construction also relieves the abutments from a great portion of the lateral pressure consequent from the thrust of the arch.

In this year, 1839, Stephen H. Long, of the United States Army, was granted two patents for truss bridges, bearing date Nov. 7. The first patent, fourteen years after was ex-

FIG. 2.

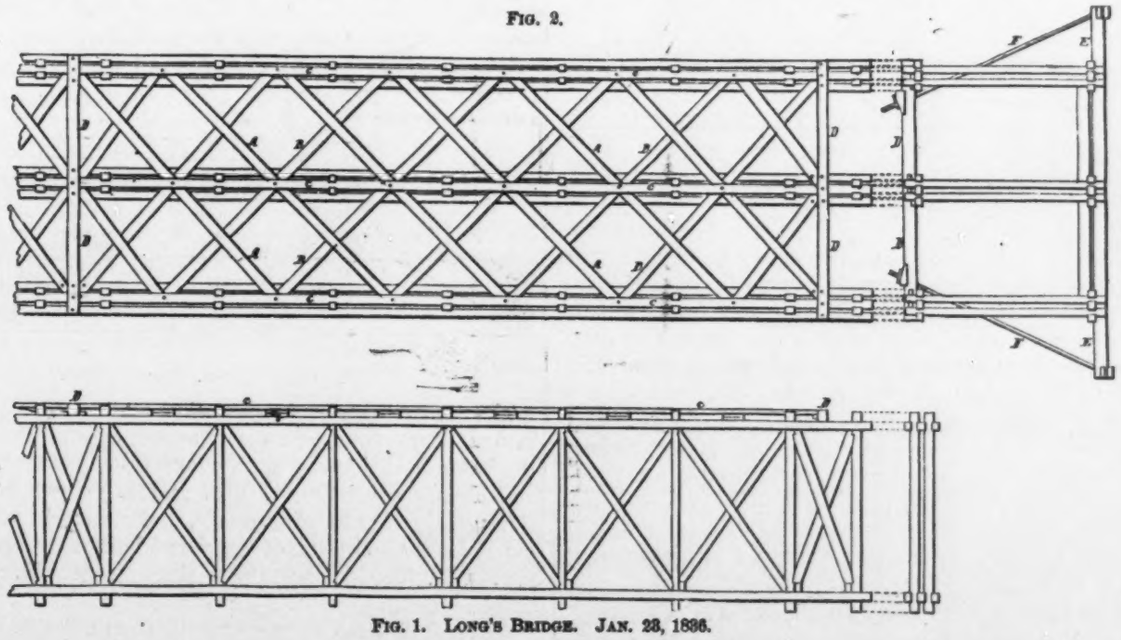


FIG. 1. LONG'S BRIDGE. JAN. 23, 1836.

tended by the Patent Office seven years, and the second was re-issued July 20, 1841.

The first of these illustrated by the plates, is composed of truss frames, arch and lateral braces, flooring, etc., and was

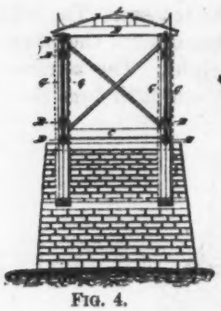


FIG. 4.

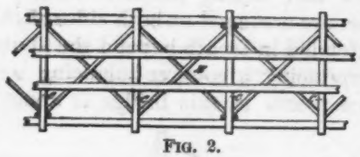


FIG. 2.

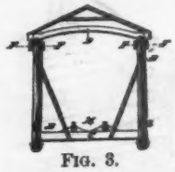
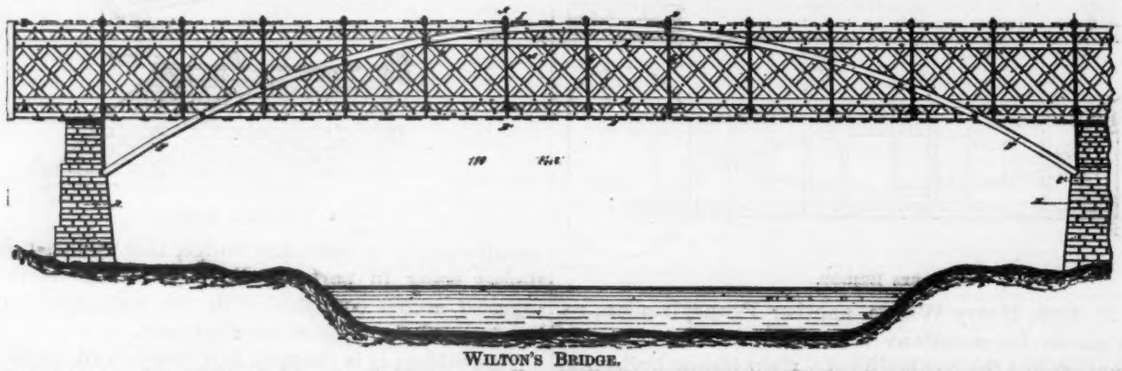


FIG. 3.

distinguished from other bridges then in use, in that the posts acted by *thrust* instead of tension, and the main and o unter braces by *tension* instead of thrust.

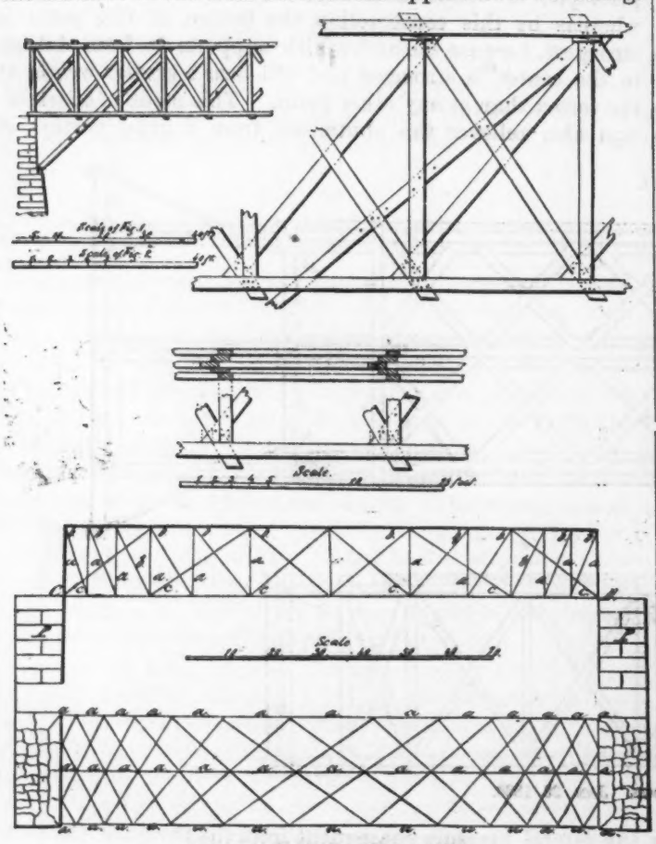
occupy space between the central and outer chord pieces. At the center of the span the main braces are halved or locked together and tree-nailed to the chords as, also, are the other portions of the bridge. The counter braces are tree-nailed at the heads and feet between the main braces. Arch braces may be applied in a manner to act as suspension braces by erecting a gallows at each pier and abutment of sufficient height and strength.

Engineer Long formulated a rule, at this early date, for giving an equable action to the main braces in all the panels of a bridge, viz: Let the extent of the bridge span between the abutments or piers be 120 ft., and the height of truss-frame, or rather the distance from center to center of the chords, be 15 ft. Now the first panels should have a distance measured on the chords from center to center of the post equal to 5¼ ft.; the second panel a distance of 6¼ ft; the third equal to 7¼ ft.; the fourth 9¼ ft.; the fifth 13 ft.; and the sixth 18 ft.; making the aggregate extent of the half span equal to 60 ft. By this arrangement (and which is illustrated in diagrams 1 and 2), the main braces, it is asserted,



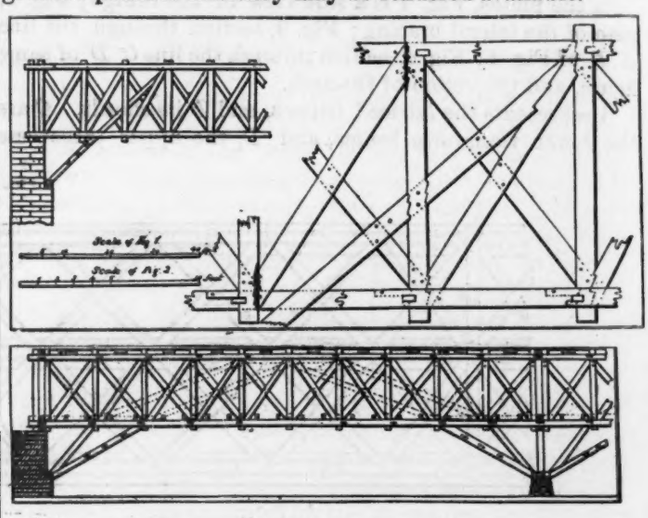
WILTON'S BRIDGE.

The length of the posts of this bridge is such as to occupy the distance in the clear between the upper and lower strings



(1) LONG'S BRIDGE. NOV. 7, 1839.

or chords, or rather somewhat short of this distance, in order to admit a wedge, or a set of counter wedges, between one end of the post and the contiguous chord. The main braces will be subjected to nearly an equable action and their greatest possible efficiency may be rendered available.



(2) LONG'S BRIDGE. NOV. 7, 1839.

The second bridge construction of Engineer Long provides, instead of the notches, recesses and wedges in the chords of the before-mentioned patent, connections between the posts and chords consisting of gibs and keys passing entirely through the chords transversely, and resting in notches prepared for the reception of the gib and key in the back of the post or in the side opposite to the steps at which the main braces communicate their thrust against the posts. The arch braces rise in three or more pieces from a bench or holster attached to the abutment, and pass through the lower string in two or more pieces. The splicing of the chords are effected by means of wooden splicing pieces in appropriate notches. The bracing is effected by locked lattice work.

(TO BE CONTINUED.)